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# TECHNICAL MEMORANDUM

(TM Series)

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Utility System Program Specifications

SYSTEM

Revision of COPII

DEVELOPMENT

By

CORPORATION

B. R. Pruett

2500 COLORADO AVE.

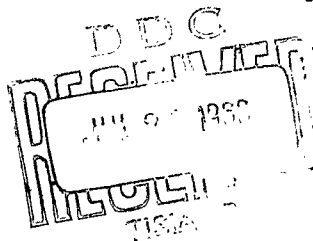
1 May 1963

Approved

SANTA MONICA

J. A. Kneemeyer

CALIFORNIA



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This document is one of a series of TM-891 volumes established for Utility System program specifications.

Comments on this document must be received by 1 June, 1963 to be reflected in the final design criteria. It is anticipated that this feature will be available in the AF/CPL on 1 September, 1963. The publication of a volume in the TM-705 (Systems Manual) series will officially announce the completion of this project.

### Revision of COPII

#### 1.0 INTRODUCTION

Modifications have been made to the COPII System to provide capabilities required by the users and to improve the efficiency of the system. Two additional modifications will be made to the COPII System. One, a two-tape system will be implemented to stabilize the Utility and Support System (USS), to separate USS and flight specific work and to achieve better control procedures. Secondly, the format of the system tapes will be modified so that the control program can process input from high density tapes. These two changes to the system will result in a more efficient system operationally as well as an easier system to maintain.

All the programs affected by these modifications will be altered and validated by System Development Corporation. In addition to program acceptance tests, there will be a month of integrated testing prior to releasing the new system.

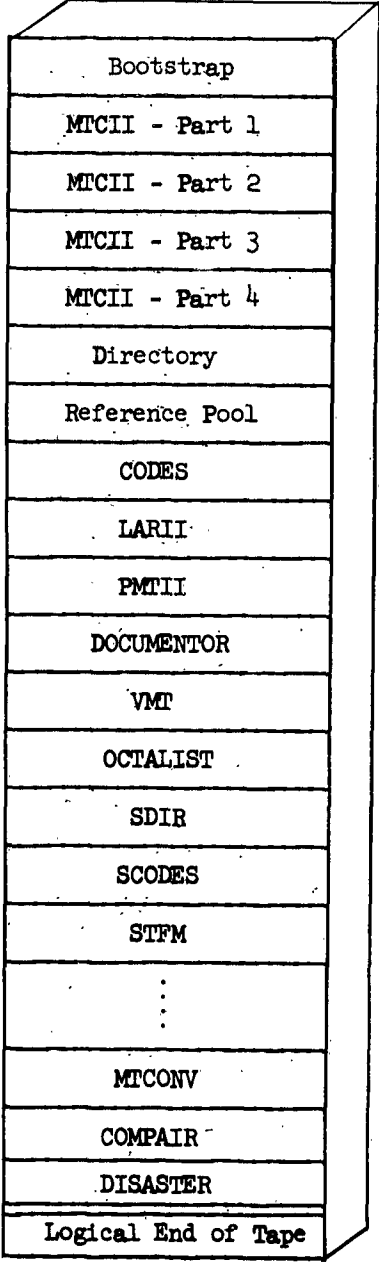
#### 2.0 TWO TAPE SYSTEM

There will be two types of tapes in the new system, flight and utility tapes. The flight tape will contain all the vehicle oriented routines, functions, tables and buffers. The utility tape will consist of all utility and general purpose satellite routines. There will be numerous flight specific tapes but only one utility tape in use per installation. A utility back-up tape will always be retained. The flight tape will be dependent upon the utility tape for all the standard routines. The utility tape will be mounted on logical unit one and the nominal selection for the flight tape will be unit twelve (12). Duplicate routines will not be allowed.

There will be two modes of operation, flight or utility, which may be specified via a control card or determined by MTCII. If a control card is utilized to specify the mode, MTCII will initiate the proper mode. Otherwise, MTCII will determine the mode by attempting to read the tape on unit 12. If the tape is a Flight tape, the flight mode is initiated; otherwise the utility mode is assumed. The mode is then logged on the printer for verification purposes.

## 2.1 UTILITY TAPE

The System Utility Master (SUM) will have the following format. The first eight records will be fixed and will be controlled by PMTII.



Bootstrap
MTCII - Part 1
MTCII - Part 2
MTCII - Part 3
MTCII - Part 4
Directory
Reference Pool
CODES
LARII
PMTII
DOCUMENTOR
VMT
OCTALIST
SDIR
SCODES
STFM
:
MTCONV
COMPAIR
DISASTER
Logical End of Tape

- 2.1.1 Bootstrap. The Bootstrap routine will be modified so that it can process the control program from a high density tape. The tape identification contained in the bootstrap record will be shortened by two words to eliminate the flight information.
- 2.1.2 MTCII. The control program will consist of four records to enable the usage of upper core by functions.
- 2.1.3 Directory. The directory on the utility tape will define the contents of the utility tape.
- 2.1.4 Reference Pool. A standard reference pool will be kept on the utility tape. If in the utility mode or if a flight specific reference pool is not available on the flight tape, the Reference Pool from the utility tape will be loaded.
- 2.1.5 CODES Table. The CODES table will exist in relocatable card image format and may be referenced by a function.
- 2.1.6 LARII. The standard Reference Symbol Table (RST) will exist internal to the assembly program. If in the flight mode, the flight specific RST table will be loaded whenever LARII is operated.
- 2.1.7 PMTII. Either flight or utility tapes may be prepared by PMTII. After the preparation of a new tape, PMTII will offer the options of returning to control, validating the new master, or operating the documentor.
- 2.1.8 Documentor. The documentor will monitor the output and operation of VMT, OCTALIST, SDIR, SCODES, SMUD and PMTII and produce, in a format acceptable by document duplication, a document describing the contents of the newly prepared tape.
- 2.1.9 SDIR and SCODES. The DIR and CODES pseudos will be separated from the control program by making them elements on the master tape. The CODES pseudo will be changed to SCODES and DIR to SDIR. SDIR will be expanded to provide the SALUTE option and output from both SDIR and SCODES can be requested in an alphabetical order. Both elements will be compatible with the documentor.
- 2.1.10 Other Elements. All other elements which are dependent upon the Master Tape format will be modified.

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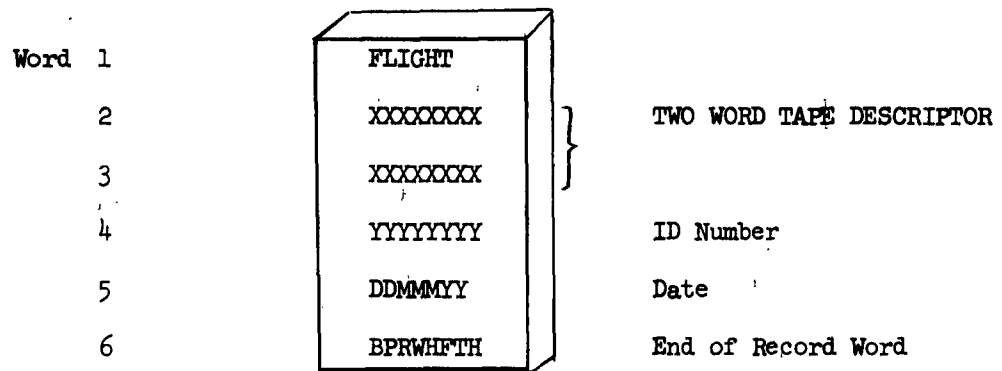
## 2.2 FLIGHT TAPE

The format of the flight tape is as follows:

Tape Ident
Directory
Ref Pool (FLT. SP.)
RST (FLT.SP.)
FLT. SP. FUNCTIONS
FLT. SP. ROUTINES
FLT. SP. TABLES
FLT. SP. BUFFERS
SPETAB's
⋮
Logical End of Tape

The first four records are fixed in order; however, the third and fourth records are optional. The flight tape will contain all the flight specific elements. An element can not exist both on a utility and a flight tape.

2.2.1 Tape Ident. The tape identification record on the flight tape consists of six words and is as follows:



2.2.2 Directory. The second record of the flight tape will define the contents and ordering of the tape.

2.2.3 Reference Pool. The flight specific reference pool will be optional. If it does not exist, the standard Reference Pool from the utility tape will be used.

2.2.4 RST Table. The flight specific Reference Symbol Table will be optional and if it exists will be in absolute card image form. It will be loaded whenever an assembly or disassembly is made.

2.2.5 Other Elements. The remaining elements on the flight tape may be in any order, preferably in the order of usage. These elements include flight specific functions, subroutines, tables, buffers and SPETAB's.

### 3.0 MASTER TAPE FORMAT

The format of the Master Tape will undergo the following changes.

1. All records except the Bootstrap will have record identification.
2. All records except Bootstrap, tape ident, and the directory will be in card image format.
3. The CODES table will be in relocatable card image form and may be referenced by functions.
4. There will be a logical record for each element on the tape which will consist of N physical records with a limit of 100 card images per record.

5. The transfer card will have a new word, i.e., a record check sum. The entry on the transfer card in the upper address of the third word will denote the number of corrector cards.
6. The directory will have a new field in the element descriptor block. This entry will indicate the number of physical records that comprise an element. A new block will be added to the directory following the list of names. This block will give the ID number and mod of each element.
7. All records have an "end of record" word equal to "BPRWHFTH" in BCD.
8. The logical end of tape will consist of a double end of file.



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Logical Record

An element will consist of N records with a maximum of 100 card images per record.

Record 1

Record Identifier
Card Image 1
⋮
Card Image N
End of Record Word

Record 2

Record Identifier
Card Image 1
⋮
Card Image N
End of Record Word

⋮

Record N

Record Identifier
Card Image 1
⋮
Card Image N
End of Record Word

Logical Record for element. The size of the first N-1 records will consist of 100 card images per record. The last record will be 100 or less.



The record identifier will consist of three words. The first two words will be identical for each record comprising an element.

Word 1 =	XXXXXXXX	Name of element in BCI left justified.
2 =	YYYYYYZ	The CPL number and mod for element with an update flag (Z), e.g. 75703AGO
	or	
	YYYYY.ZZ	The CPDC working ID number and mod and an update flag (ZZ), e.g., H03AC.01
		The Z flag starts with zero in BCI and is incremented each time the element is updated with correctors.
3 =	AA0BBBBB	The third word of the record identifier is in octal,
	000CCCCC	where AA is the number of records comprising the element, BBBB is the record number (e.g. 1 of 3 records) and CCCCC is the number of card images in the record.

The nth card image of each record is a transfer card. This card consists of three words:

Word 1 -	Control word with word count equal to zero. The format of the control word is the same as for any card image.
2 -	Checksum for entire record consists of 48 bits.
3 -	000 XXXXX where XXXXX is the number of correctors in the record. If there are no correctors XXXXX will be zero.
	000 YYYYY YYYYY is the length for relocatable programs or the starting location for absolute elements.

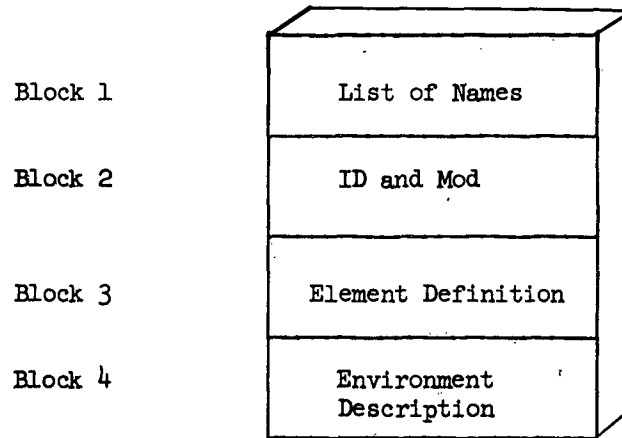


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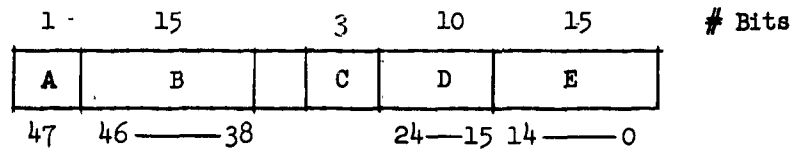
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The format of the directory will be expanded to contain the ID and mod number for each element and the number of records per element.



Block 1 and 2 of the directory will contain information for each element identical to the first two words of the record identifier. There will be one entry in the directory per element.

A new field will be in block three to indicate the number of records comprising each element. The format of a block three entry is:



where A is the mode flag, relocatable or absolute.

B is the cross reference matrix indicating the words that exist for the element in the environment description.

C is the number of records comprising each element.

D is the CODES number for each element.

E is the length of a relocatable element or the starting location of an absolute element.

#### 4.0 COPII OPERATION

When auto load is depressed, the bootstrap routine will be loaded and executed. Bootstrap will then load the first record of the control program. After the required portions of MTCII have been loaded, the first request will be accepted to determine if the "mode of operation (MO)" card has been entered. If it is not an MO card, the first six words of the first record of the tape mounted on unit 12 will be interrogated. If a flight tape is mounted, the flight mode will be assumed; otherwise the utility mode will be initiated. If an MO card is read, the mode will be determined from this card as well as the unit number if the flight mode is required. Once the mode of operation has been established the appropriate directories and Reference Pool will be loaded. The tapes and mode will be logged for verification purposes. The first request will be processed and the remainder of the system operation will be compatible with the current system.

The control program will read elements from both the flight and utility tape. The relocation process will take place after an entire record has been loaded from tape to provide for high density tapes.

#### 5.0 MODIFICATIONS TO MTCII

The COPII control program, MTCII, is utilized more than any other element in the system. For this reason modifications to it are of interest to all users. The changes that will be made in mod AH of MTCII include the following:

##### 5.1 MULTI-RECORD

MTCII will be separated into logical sections so that only the code necessary for the requested operation will be retained in upper core. This will increase the continuous loading area and will allow more functions to be operated in succession.

DIR and CODES will be separated from control. The remainder of MTCII will be divided into four phases - function dependent code (the permanent area in lower core), pseudos, special operating mode, and the function request cycle.

After reading a request and prior to interpreting it, MTCII will determine what part of control is required and will load it. If the request is for a function already in core, MTCII will process the request without disturbing upper core.

## 5.2 SPECIAL OPERATING MODE

The usage of the Special Operating Mode (SOM) will be improved so that debugging functions in the mode will be less restrictive. The capabilities of the SOM mode will be expanded to provide for retaining more than one communications area.

## 5.3 ERROR INDICATION

More information will be logged whenever errors are encountered.

## 5.4 LOADING TECHNIQUE

The technique for loading elements from the Master Tapes will be modified to handle high density tapes and multi-record elements.

## 5.5 MACRO CAPABILITY

To automate the control and operation of functions, the SMACRO function will be incorporated into the system as described in TM-890/004/00, "Proposal for Macro Functions in COPII". There will be one change in the method of requesting a macro-function; i.e., a request will be made for SMACRO with the name of the macro as the first parameter on the request.

\* SMACRO    MACRONAME    P<sub>1</sub> .....

## 5.6 SYSTEM ON-LINE OUTPUT

An optional output unit will be a parameter on the \* MO card. Unless otherwise specified on this card the on-line output unit will be the 1612 printer. This option will provide a means by which the system can be operated when the printer is inoperative.

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